In the Claims:

1. (Original) A method for forming a nanostructure, comprising self-assembling a nanodot array in a matrix material from a nanodot material based upon a difference in Gibb's free energy of oxidation of the nanodot material and the matrix material.

2. (Original) The method of claim 1, wherein the difference in Gibb's free energy of oxidation between the nanodot material and the matrix material is at least 100 kcal per mole.

3. (Original) The method of claim 1, wherein the difference in Gibb's free energy of oxidation between the nanodot material and the matrix material is between about 100 kcal per mole and about 200 kcal per mole.

4. (Original) The method of claim 1, wherein the difference in Gibb's free energy of oxidation between the nanodot material and the matrix material is about 150 kcal per mole.

5. (Original) The method of claim 1, further comprising oxidizing the matrix material substantially simultaneously with the self-assembly of the nanodot array.

6. (Original) The method of claim 1, wherein self-assembling a nanodot array in a matrix material is performed repetitively to form a plurality of self-assembled nanodot arrays stacked on one another.

7. (Original) The method of claim 6, wherein at least three nanodot arrays are self-assembled on one another.

8. (Original) A nanostructure, comprising nanodots in an oxidized matrix material, wherein the matrix material has a lower Gibb's free energy of oxidation than

the nanodots.

9. (Original) The nanostructure of claim 8, wherein the difference in the Gibb's free energy of oxidation of the matrix material and the nanodots is about 100 kcal per mole.

10. (Original) The nanostructure of claim 8, wherein the difference in the Gibb's free energy of oxidation of the matrix material and the nanodots is about 150 kcal per mole.

11. (Original) The nanostructure of claim 8, wherein the difference in the Gibb's free energy of oxidation of the matrix material and the nanodots is between about 100 kcal per mole and about 200 kcal per mole.

12. (Original) The nanostructure of claim 8, wherein the nanodots are uniformly dispersed in the oxidized matrix material.

13. (Original) The nanostructure of claim 12, wherein the uniformly dispersed nanodots are spaced approximately 4 nm from each other on average.

14. (Original) The nanostructure of claim 8, wherein the nanodots have an average diameter of about 6 nm.

15. (Original) The nanostructure of claim 8, wherein the nanodots are nickel and the matrix material is aluminum.

16. (Original) The nanostructure of claim 15, wherein the nickel nanodots have an average diameter of 6 nm.

17. (Original) The nanostructure of claim 15, wherein the nickel nanodots are

uniformly distributed in the oxidized aluminum matrix material with a spacing of about 4 nm between the nickel nanodots.

18. (Original) The nanostructure of claim 8, wherein the nanodots comprise nickel, nickel alloys, platinum, platinum alloys, aluminum, aluminum alloys, magnesium, magnesium alloys, iron, and/or iron alloys.

19. (Original) The nanostructure of claim 8, wherein the matrix material comprises aluminum, aluminum alloys, aluminum oxide, nickel, nickel alloys, nickel oxide, magnesium and/or magnesium oxide.

20. (Original) A nanostructure, comprising three or more layers of uniformly dispersed nanodots in a matrix material.

21. (Original) The nanostructure of claim 20, wherein the uniformly dispersed nanodots comprise nickel.

22. (Original) The nanostructure of claim 20, wherein the nanodots have a diameter of about 10 nm.

23. (Original) The nanostructure of claim 20, wherein the nanodots have a diameter of about 6 nm.

24. (Original) A nanostructure, comprising:

a first layer of nanodots uniformly dispersed in a matrix material;

a second layer of nanodots uniformly dispersed in a matrix material, the second layer on the first layer of nanodots; and

a third layer of nanodots uniformly dispersed in a matrix material, the third layer on the second layer of nanodots.

25. (Original) The nanostructure of claim 24, wherein the nanodots comprise nickel nanodots.

26. (Original) The nanostructure of claim 24, wherein the matrix material comprises aluminum oxide.

27. (Original) The nanostructure of claim 24, wherein the nanodots comprise nanodots formed from a material selected from the group consisting of nickel, nickel alloys, platinum, platinum alloys, aluminum, aluminum alloys, magnesium, magnesium alloys, iron, and iron alloys.

28. (Original) The nanostructure of claim 24, wherein the matrix material comprises a matrix material selected from the group consisting of aluminum, aluminum alloys, aluminum oxide, nickel, nickel alloys, nickel oxide, magnesium, and magnesium oxide.

29. (Original) A method for promoting the self-assembly of nanodots, comprising:

providing a deposition apparatus having a deposition chamber;

providing a target comprising a nanodot material within the deposition chamber;

providing a substrate within the deposition chamber;

forming a plasma of nanodot material in the deposition chamber by evaporating at least a portion of the target comprising a nanodot material, wherein the plasma forms at least one nanodot material containing monolayer on the substrate; and

allowing the at least one nanodot material containing monolayer on the substrate to self-assemble into nanodots of the nanodot material.

30. (Original) The method of claim 29, wherein said nanodot material comprises a nanodot material selected from the group consisting of nickel, nickel alloys, platinum, platinum alloys, aluminum, aluminum alloys, magnesium, magnesium

alloys, iron, and iron alloys.

31. (Original) The method of claim 29, further comprising:

providing a target comprising a matrix material within the deposition chamber; and

forming an plasma of matrix material in the deposition chamber by evaporating at least a portion of the target comprising a matrix material, wherein the plasma forms a layer of matrix material on the substrate and any nanodots assembled thereon.

32. (Original) The method of claim 31, wherein forming a plasma of nanodot material and forming a plasma of matrix material are performed sequentially to form a plurality of alternating nanodot structures and matrix material layers wherein at least a portion of the matrix material layers are dispersed on the nanodots.

33. (Original) The method of claim 31, wherein the matrix material comprises a matrix material selected from the group consisting of aluminum, aluminum alloys, aluminum oxide, nickel, nickel alloys, nickel oxide, magnesium, and magnesium oxide.

34. (Original) The method of claim 31, wherein the Gibb's free energy of oxidation of the matrix material is lower than the Gibb's free energy of oxidation of the nanodot material.

35. (Original) The method of claim 31, wherein a difference between the Gibb's free energy of oxidation of the matrix material and the nanodot material is about 100 kcal per mole.

36. (Original) The method of claim 31, wherein a difference between the Gibb's free energy of oxidation of the matrix material and the nanodot material is about 150 kcal per mole.

37. (Original) The method of claim 31, wherein a difference between the Gibb's free energy of oxidation of the matrix material and the nanodot material is between about 100 kcal per mole and about 200 kcal per mole.

38. (Original) A method for forming nanodots on a substrate, comprising:

providing a deposition apparatus having a deposition chamber;

providing at least one substrate within the deposition chamber;

providing at least one target material within the deposition chamber;

ablating the at least one target material, wherein the ablation forms a plasma;

forming a layer of target material on the substrate; and

reacting oxygen with the layer of target material on the at least one substrate, wherein at least a portion of the oxygen reacts with a first portion of the target material to form a matrix material and a second portion of the target material self-assembles into nanodots.

39. (Original) The method of claim 38, wherein the at least one target material comprises a nanodot material and a matrix material.

40. (Original) The method of claim 39, wherein the nanodot material comprises a nanodot material selected from the group consisting of nickel, nickel alloys, platinum, platinum alloys, aluminum, aluminum alloys, magnesium, magnesium alloys, iron, and iron alloys.

41. (Original) The method of claim 39, wherein the matrix material comprises a matrix material selected from the group consisting of aluminum, aluminum alloys, aluminum oxide, nickel, nickel alloys, nickel oxide, magnesium, and magnesium oxide.

42. (Original) The method of claim 38, wherein the Gibb's free energy of oxidation of the first portion of the layer of target material is lower than the Gibb's free energy of oxidation of the second portion of the layer of target material.

43. (Original) The method of claim 38, wherein a difference between the Gibb's free energy of oxidation of the first portion of the layer of target material and the second portion of the layer of target material is about 100 kcal per mole.

44. (Original) The method of claim 38, wherein a difference between the Gibb's free energy of oxidation of the first portion of the layer of target material and the second portion of the layer of target material is about 150 kcal per mole.

45. (Original) (Original) The method of claim 38, wherein a difference between the Gibb's free energy of oxidation of the first portion of the layer of target material and the second portion of the layer of target material is between about 100 kcal per mole and about 200 kcal per mole.

46. (Original) A method for forming nickel nanodots, comprising:

providing a deposition apparatus having a deposition chamber;

providing a nickel containing target within the deposition chamber;

providing a substrate within the deposition chamber;

forming a nickel containing plasma in the deposition chamber by evaporating at least a portion of the nickel containing target, wherein the nickel containing plasma forms at least one nickel containing monolayer on the substrate; and

allowing the at least one nickel containing monolayer on the substrate to self-assemble into nickel nanodots.

47. (Original) The method of claim 46, further comprising:

providing an aluminum containing target within the deposition chamber; and

forming an aluminum containing plasma in the deposition chamber by evaporating at least a portion of the aluminum containing target, wherein the aluminum containing plasma forms a layer of aluminum on the substrate and any nickel nanodots assembled thereon.

48. (Original) The method of claim 47, wherein forming a nickel containing plasma and forming an aluminum containing plasma are performed sequentially to form a plurality of alternating nickel quantum structures and aluminum layers wherein at least a portion of the aluminum layers are dispersed around the nickel nanodots.

49. (Original) The method of claim 46, wherein providing a nickel containing target within the deposition chamber comprises providing a nickel aluminum alloy target within the deposition chamber.

50. (Original) The method of claim 49, further comprising:

forming an aluminum containing plasma in the deposition chamber in conjunction with the nickel containing plasma by evaporating at least a portion of the nickel aluminum alloy target, wherein the aluminum containing plasma and nickel containing plasma form at least one nickel and aluminum containing monolayer on the substrate; and

exposing the at least one nickel and aluminum containing monolayer on the substrate to oxygen, wherein at least a portion of the aluminum in the at least one nickel and aluminum containing monolayer on the substrate reacts with the oxygen to form aluminum oxide while allowing the at least one nickel containing monolayer on the substrate to self-assemble into nickel nanodots.

51. (Original) The method of claim 49, wherein forming a nickel containing plasma comprises forming a nickel and aluminum containing plasma in the deposition chamber by evaporating at least a portion of the nickel aluminum alloy target, wherein the nickel and aluminum containing plasma forms at least one nickel and aluminum containing monolayer on the substrate.

52. (Original) The method of claim 51, wherein allowing the at least one nickel containing monolayer on the substrate to self-assemble into nickel nanodots further

comprises exposing the at least one nickel and aluminum containing monolayer to oxygen, wherein the aluminum in the at least one nickel and aluminum containing monolayer reacts with the oxygen to form aluminum oxide.

53. (Original) The method of claim 46, wherein evaporating at least a portion of the nickel containing target comprises evaporating at least a portion of the nickel containing target using a pulsed laser deposition process.

54. (Original) The method of claim 46, wherein evaporating at least a portion of the nickel containing target comprises evaporating at least a portion of the nickel containing target using an energy source selected from the group consisting of lasers, radio frequency, and electron beams.

55. (Original) The method of claim 46, wherein the substrate comprises silicon.

56. (Original) The method of claim 46, wherein the nickel nanodots are uniformly dispersed.

57. (Original) The method of claim 46, wherein the nickel nanodots comprise nickel nanodots having an average size of about 6 nm.

58. (Original) The method of claim 46, wherein the nickel nanodots comprise nickel nanodots having an average spacing of about 4 nm.

59. (Original) A method for forming nickel nanodots on a substrate, comprising:

providing a deposition apparatus having a deposition chamber;

providing at least one substrate within the deposition chamber;

providing at least one nickel and aluminum containing target within the

deposition chamber;

ablating the at least one nickel and aluminum containing target, wherein the ablation forms a nickel and aluminum plasma;

forming a layer of nickel and aluminum on the at least one substrate; and

reacting oxygen with the layer of nickel and aluminum on the at least one substrate, wherein at least a portion of the oxygen reacts with aluminum to form an aluminum oxide and promotes the self-assembly of nickel nanodots.

60. (Original) The method of claim 59, wherein providing a deposition apparatus comprises providing a pulsed laser deposition apparatus.

61. (Original) The method of claim 59, wherein providing a deposition apparatus comprises providing a pulsed excimer laser deposition apparatus.

62. (Original) The method of claim 61, wherein the pulsed excimer laser deposition apparatus comprises a pulsed KrF excimer laser apparatus.

63. (Original) The method of claim 59, wherein providing at least one substrate and at least one nickel and aluminum containing target within the deposition chamber comprises providing the at least one substrate positioned parallel to the at least one nickel and aluminum containing target.

64. (Original) The method of claim 59, wherein providing at least one nickel and aluminum containing target within the deposition chamber comprises providing at least one nickel aluminum alloy target within the deposition chamber.